

Multiscale GasKinetics/Particle (MGP) Simulation for Rocket Plume/Lunar Dust Interactions, Phase I

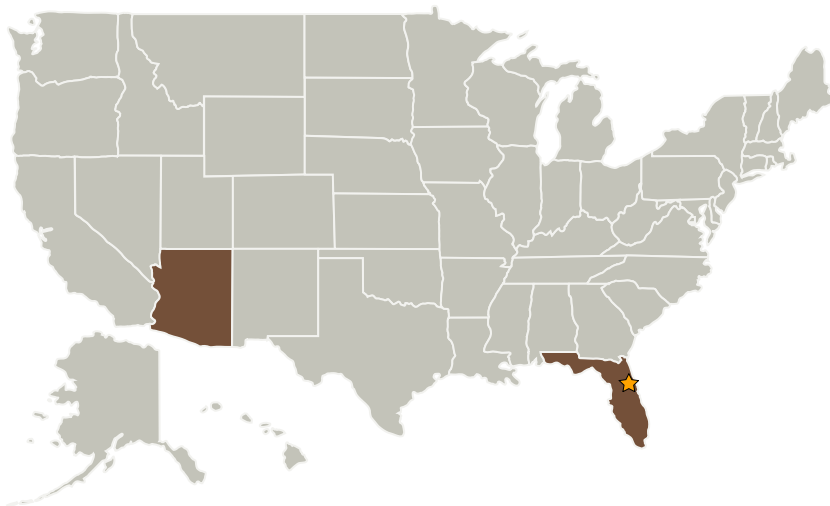
Completed Technology Project (2009 - 2010)



Project Introduction

A Multiscale GasKinetic/Particle (MGP) computational method is proposed to simulate the plume-crater-interaction/dust-impingement(PCIDI) problem. The MGP method consists of a multiscale gaskinetic (MG) method for gasdynamics of rocket plume-in-vacuum flowfield, an Overlay method for gas-particle interaction. MG combines BGK Gaskinetics (BGK) and direct simulation Monte Carlo (DSMC) methods with a domain decomposition technique to account for various scales of rarefied gasdynamics, covering continuum to free-molecular regimes. The dust particles are modeled by an additional distribution function in BGK, thus carried by the MG-generated flowfield through an overlay method. Dust properties are to be modeled using Discrete Element Method (DEM) simulation, which will lead to comprehensive continuum equations for crater formation. Phase II will extend the present MGP method to 3D, with more advanced dust particle properties and complex crater formulation.

Primary U.S. Work Locations and Key Partners



Multiscale GasKinetics/Particle (MGP) Simulation for Rocket Plume/Lunar Dust Interactions, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Transitions	2
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Multiscale GasKinetics/Particle (MGP) Simulation for Rocket Plume/Lunar Dust Interactions, Phase I

Completed Technology Project (2009 - 2010)



Organizations Performing Work	Role	Type	Location
★ Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
ZONA Technology, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona

Primary U.S. Work Locations

Arizona	Florida
---------	---------

Project Transitions

 **January 2009:** Project Start **January 2010:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL